Daily Manual for Operators

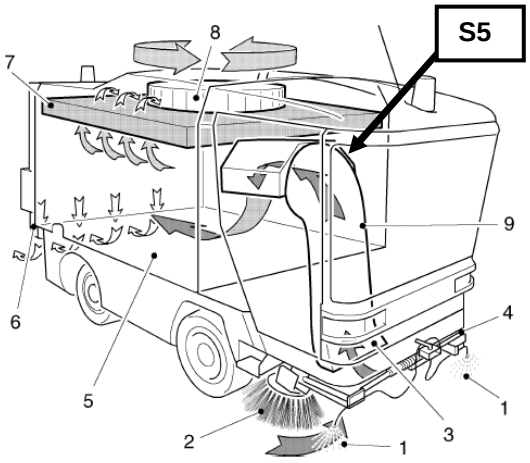
RAVO 5-Series

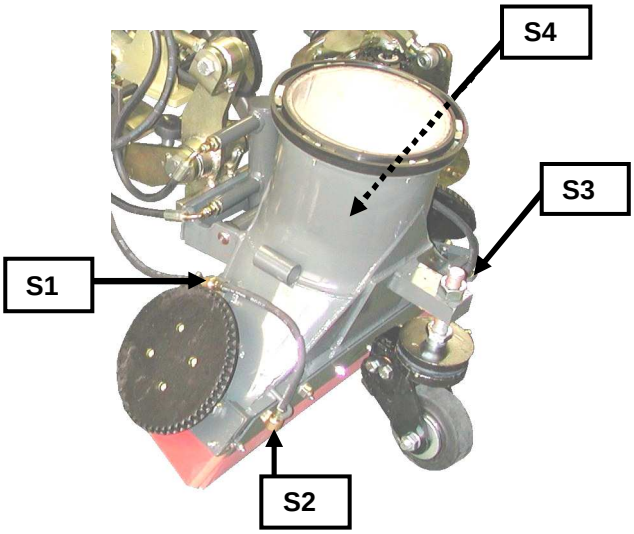
1	Adjustment + inspection suction mouth	Page 1
2	Adjustment + inspection brush and water system	Page 3
3	Optimum RPM during sweeping	Page 6
4	Optimum use of the brushes	Page 7
5	Cleaning and inspection of the sweeper	Page 8
6	Taking properly care of the Diesel engine, filters and water system	Page 10
7	What to do in case of a dead battery	Page 12
8	Towing the sweeper	Page 12
9	Part Numbers	Page 13

N.B.: This manual is an addition to the normal owner's manual booklet. So in case of questions always check the normal booklet!

1 Suction mouth: Adjustment + Inspection

The four spray nozzles (S1, S2, S3, S4) and the spray nozzle in the suction tube bend (S5) are very important for the sweeping result and the wear of the sweeper.





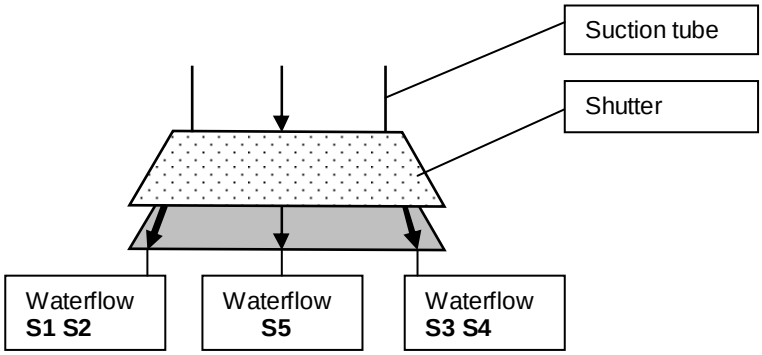
These nozzles are likely to get clogged every now and then and especially once turned off during sweeping, so always keep them on while sweeping!

These nozzles need to be checked daily before every shift!!!

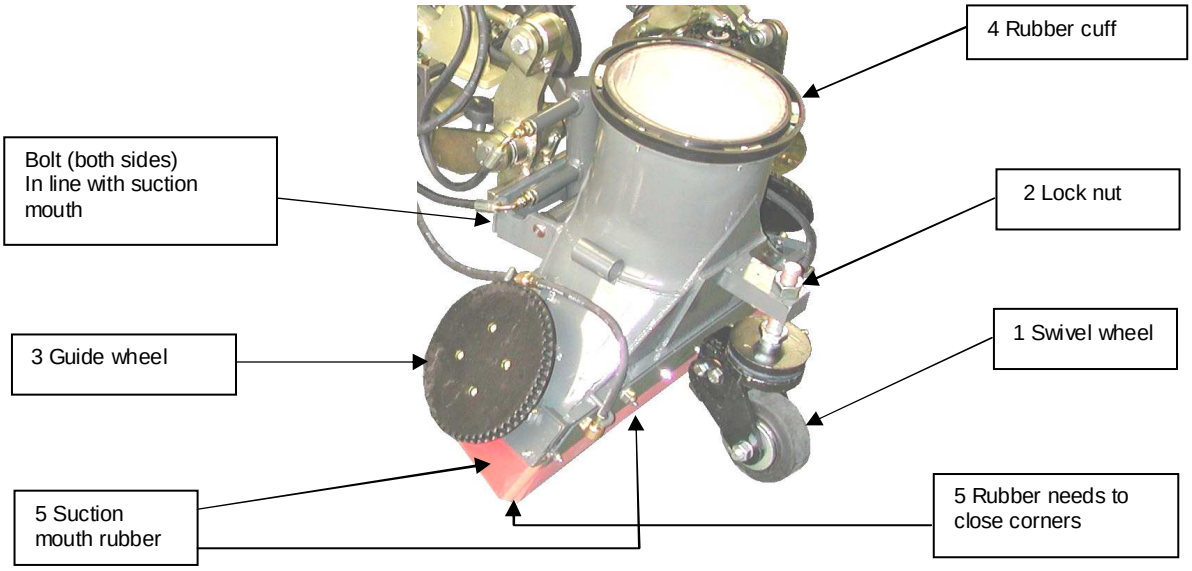
Procedure to check the nozzles:

1 - Move the suction mouth shutter to the highest position
2 - Switch off the fan.
3 - Switch the spray water pump to position 2 (suction mouth spray nozzles are on).
4- Stand in front of the sweeper to have a look in the suction mouth. The water drainage should be the following:
- The amount of water should be equal left and right
- The water in the middle will be less since there is only one nozzle (S5)

The water should slowly poor out of the suction mouth. In case it is not as above one of the nozzles is most likely clogged. When lifting the sweeper with the pneumatic suspension you will get easy access to the suction mouth.



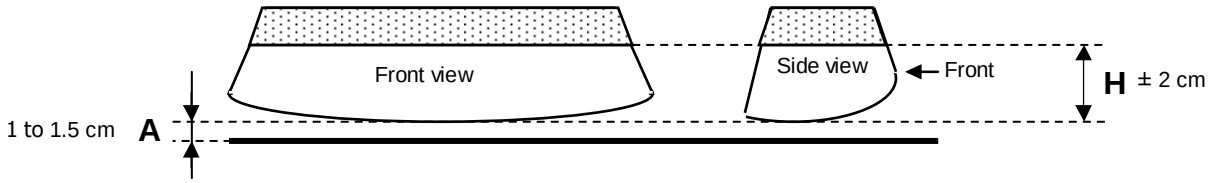
For optimum results of the suction mouth the following parts should be daily checked!!!



Check point wear and adjustable parts:

1. **Swivel wheel:** Round shape, moves in all directions, rotates easily, adjusted at the correct height
2. **Lock nut:** Well locked?
3. **Guide wheels:** Rotates easily
4. **Rubber cuff:** Closes properly (inspection through suction tube door from cabin)
5. **Suction mouth rubber:** Even wear, no cracks, well straight fitted, height **H** should be at least 2 CM (0.8 inch), movement **A** should be 1 to 1.5 CM (0.3 to 0.6 inch) -> See picture below. The height **A** should be inspected on a flat surface and the swivel wheel should be in the same direction as the wheel in the picture of the suction mouth.

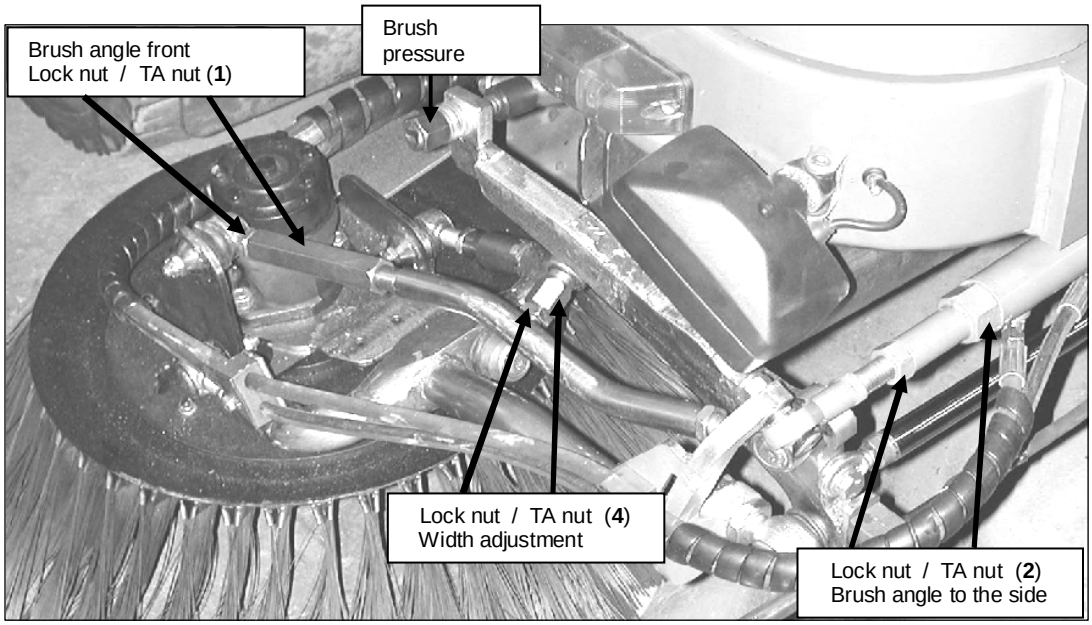
Normal wear of rubbers should be like below:



2. Brush system: Adjustment + Inspection

(for normal city sweeping, for heavy duty sweeping, different adjustments might be necessary)

Below you will find a picture of the brush system (TA nut = Tension Adjusting Nut):



Pict. 1

Important before you start !!

- Place the sweeper on a dry and straight surface (concrete floor for example) without any differences in height.
- Before you can adjust the TA nuts you first have to loosen the lock nuts. Always fasten them after the adjustment.
- Lower the brushes when they are not rotating. The waterswitch should also be off. Turn off the diesel engine.

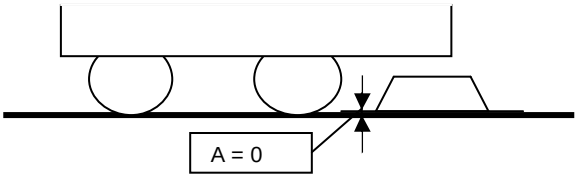
Step 1: Set reference points 0

● **Brush pressure '0'** (Spanner 27)

Set the brush pressure to the minimum by adjusting TA Nut 3, the brushes should just reach the floor.

● **Brush angle forwards '0'** (Spanner 27)

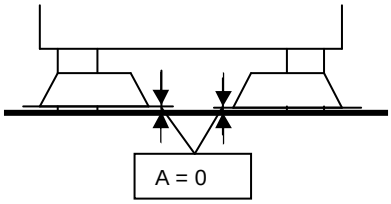
Set the brush lengthwise equal with the floor by adjusting TA Nut 1. The angle should be 0 degrees (see pict. 2).



Picture 2

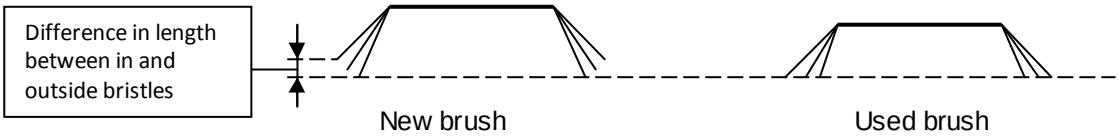
● **Brush angle sideward '0'** (Spanner 36)

Set the brush sideways equal to the floor by adjusting TA Nut 2. The angle should be 0 degrees (see pict. 3)



Picture 3

Please note: When using a new brush the bristles are not all equal to the floor since they haven't suffered any wear, with a used one all bristles should be equal to the floor (see pict. 4). When adjusting you only have to take care of the inner ring of bristles. The outer ring will only hit the floor once the inside ring is worn out.



Picture 4

Step 2: Set the optimum brush pressure

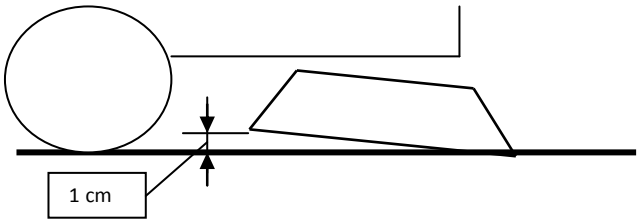
Adjust TA Nut 3 this much that:

- **New brush:** Only the inner ring of bristles will slightly bend outside when touching the floor (1 CM / 0.3 inch). The outside ring doesn't touch the floor.
- **Used brush:** Both the inner and outer ring of bristles will slightly bend outside (1 CM / 0.3 inch) when touch the floor

Please note: It is of no use to increase the brush pressure further than above described. This will only result in more wear of the brush, increased fuel use (due to higher resistance because of higher pressure) and the sweeping result will not improve!

Step 3: Set the optimum brush angle forwards

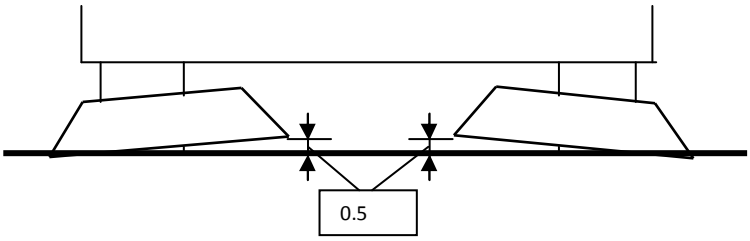
Adjust TA Nut 1 this much that the bristles are slightly lifted from the floor in the rear of the brush (around 1 CM / 0.3 inch) or this much that you can slide spanner 27 underneath.



Picture 5

Step 4: Set the optimum brush angle sideward

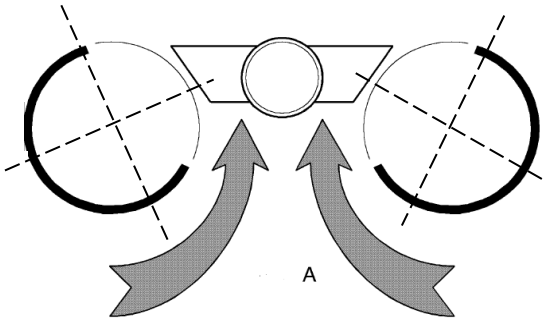
Adjust TA Nut 2 this much that the bristles are slightly lifted from the floor on the inside of the sweeper (around 0.5 CM / 0.1 inch).



Picture 6

Step 5: Check if the brushes are set correctly

Let the brushes rotate for 30 seconds on a flat surface (without the water sprinklers on). Check if the brushes are touching the surface only on the thick black line (picture 9). You can check by reversing the sweeper and looking at the marks on the floor



Picture 9

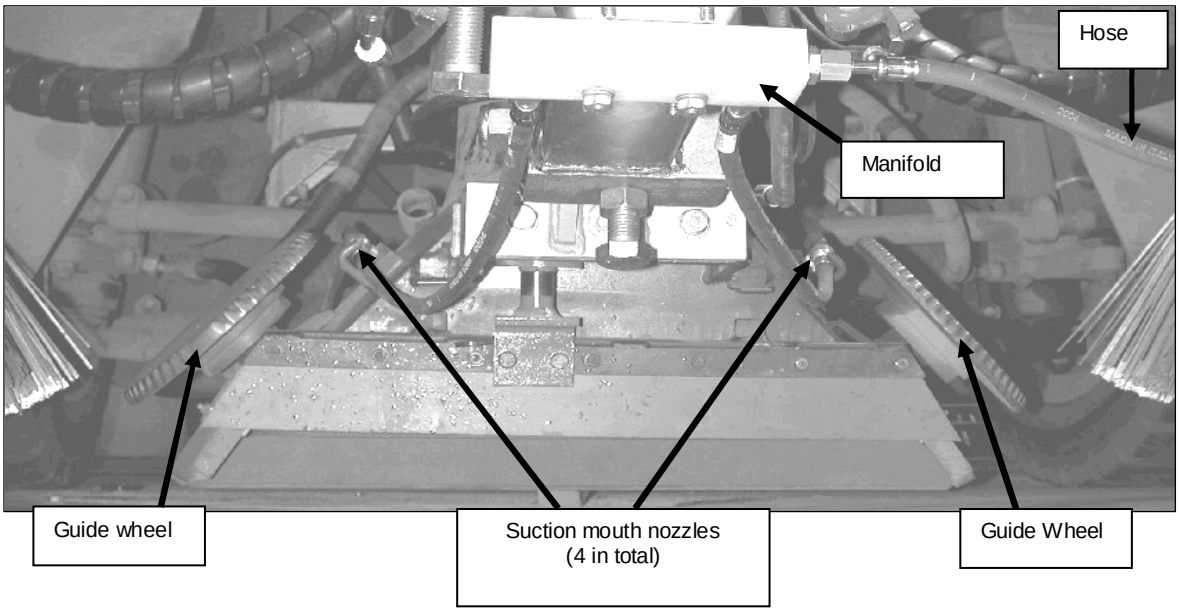
Step 6: Check the brush pressure during use

During sweeping the brushes will slowly wear out. However, due to the advanced brush system of the RAVO sweepers the brush pressure will remain constant so adjustment is normally not necessary. However, in the situation that the brush will come of the ground when sweeping it is better to adjust the brush pressure. You can do this by turning TA Nut 3 by a quarter.

Step 7: Adjustment of the width of the brushes

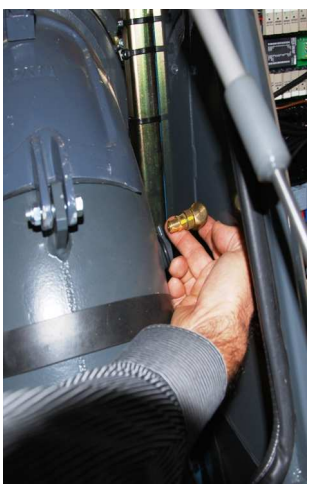
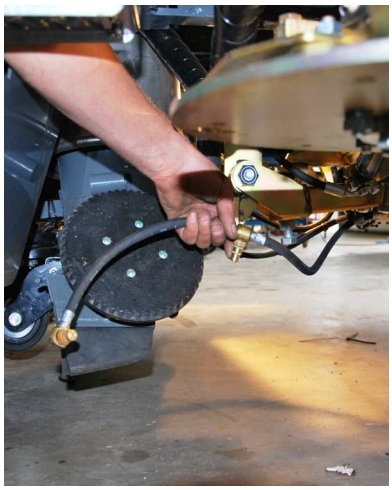
In case two thick traces of dirt appear behind the sweeper when sweeping there might be too much space between the suction mouth and the brushes. You will need to adjust the brushes inwards. You can do so by adjusting TA Nut 4.

Please note: Don't set the brushes too close to the suction mouth since then the guide wheels can't rotate.



Further important remarks:

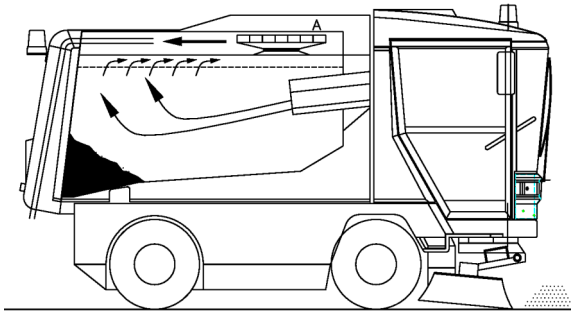
- Always check the suction mouth and other nozzles before sweeping (they can easily get stuck) (see below)
- Always check the brushes according to step 5 before sweeping if the sweeper has been used by other drivers, also the suction mouth and water system should be checked
- A normal brush can be used up to a bristle length of 5-8 CM / 2-3 inch
- Always clean the sweeper after your shift. During this cleaning you can carry out normal inspection as well
- A well adjusted and proper working sweeping machine saves time and fuel!

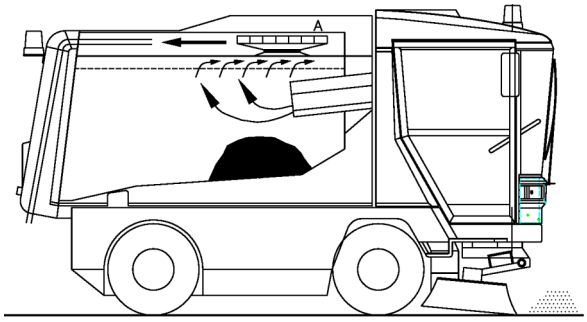
3. Optimum RPM during sweeping

It is essential to sweep with the right RPM during sweeping. This for the following reasons:

- Achieve the best sweeping result
- Save fuel
- Avoid wear and tear
- Avoid unnecessary dust
- To completely fill the hopper
- To avoid high noise levels



Picture 1: Optimal RPM



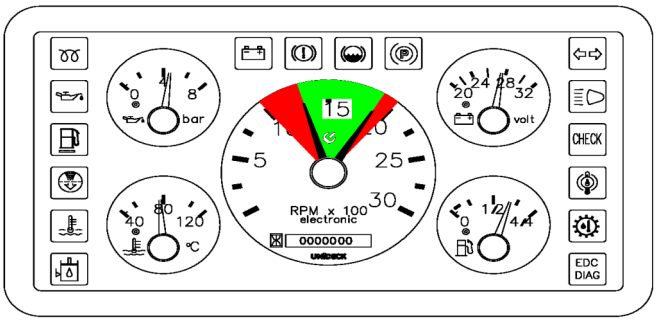
Picture 2: RPM is too low

Picture 1 - RPM Optimal: The hopper fills from the back to the front. The suction power will remain constant:
Picture 2 - RPM too low: The container fills up in the front resulting in a half filled hopper and low suction power
No picture – RPM too high: Most of the dirt will get stuck in the fan and the grids. Dust will be blown out and the sweeping system gets stuck. The machine will suffer unnecessary wear.

What is the optimum RPM during sweeping?

There is no fixed optimal RPM for sweeping since it is dependent on the sweeping conditions (dry, wet, sand, leaves, stones, weeds, rain, wind, etc.) but the following guidelines can be applied:

- **Minimum RPM is 1300**: Sweeping with less RPM is of no use since there won't be enough suction power and the hopper won't fill up. In case of sweepers with engines that use AdBlue the engine will damage by less RPM since the AdBlue system won't work.
- **Maximum RPM is 1800**: Sweeping with more RPM is of no use since the suction power won't increase but fuel use, wear and noise will.
- **Most common used is 1500 RPM**: The normal RPM 1500. This is not always right to sweep but gives you a good set point for experimenting to find the right RPM.



The safe zone for RPM on the display

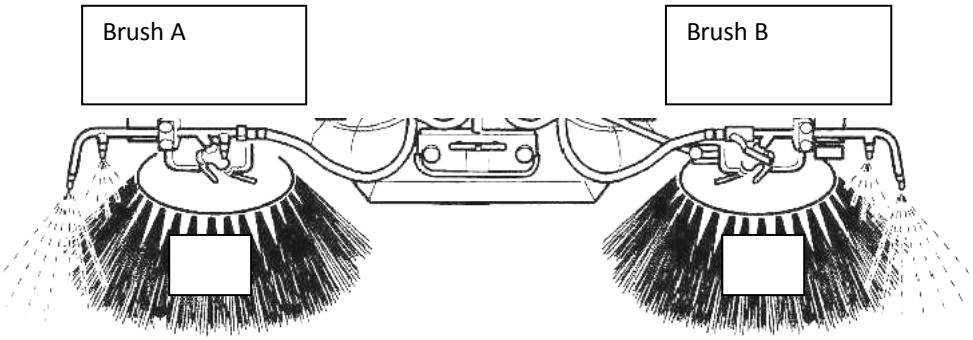
When it comes to sweeping practising is essential and it is essential to make optimal use of all the tools you have: Suction nozzle flap (for big pieces of dirt – bottles, etc.), hydraulic suspension (lift the machine to clean big piles of dirt), angle adjustment, third brush, etc. etc. Make sure you maintain your sweeper well and always use water when sweeping!

In case of dirty roads with lots of dirt sweep two times: one time with the suction flap open (high RPM) and one time with the suction mouth closed (lower RPM). This will be more effective than trying to sweep everything in one go.

4. Optimum use of the brushes

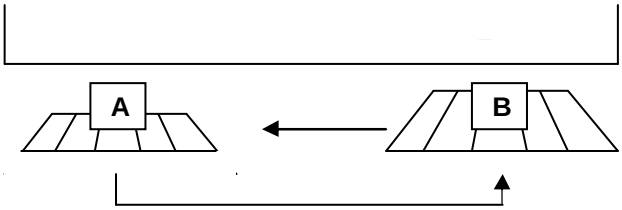
Brushes are a major cost factor in the lifetime of a sweeper. Optimal use of them can save a lot of costs. The brush on the Right Hand Side will wear out the quickest (due to the gutter). If the brushes are frequently changed the life can be extended considerably.

Start with two new brushes.

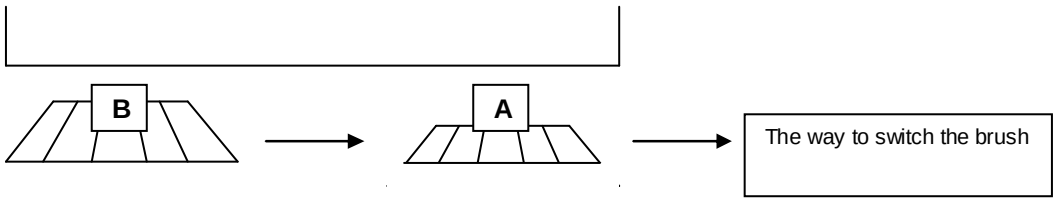


Under normal circumstances brush A wears out quicker than B.

1e



At the moment it becomes more difficult to keep brush A in the gutter, switch it with B and keep on doing so until it is necessary to replace one of the older brooms with a new one.



5. Daily cleaning and inspection of the sweeper

Proper maintenance of the sweeper is essential! Clean the machine preferably with a low pressure water hose with lots of water. It is important never to aim a high pressure or steam cleaner on rubbers, wires, plugs, etc. While cleaning most inspections can be done as well.

- **Daily inspection**
  - Suction mouth / tube: 4 Nozzles in suction tube, nozzle below suction tube bend, suction mouth rubbers and mounting, swivel wheel and locknut
  - Brushes + brush system: All rubbers (no cracks?), lock nuts, pipes and fittings
  - Inside hopper + door: Rubbers, grids, fan, water recycling system (if mounted)

  N. B.: Always leave the rear door open with 2 cm / 1 inch when storing the machine after service, don't forget to close in the morning!

- **Daily cleaning: Always use low pressure water for cleaning. In case of high pressure water use 1 meter or 3 feet distance.**
  - Suction tube and pipe (inside), brush system**:**
    - Lower the brush system and spray with water
    - switch the fan on (1100 RPM)
    - Open the suction nozzle flap and aim the water jet at the nozzle so that the nozzle will suck the water. Do so for two minutes or longer if necessary.

  - Cleaning of container and grids: Stop the fan, open the rear door and place the security handle. Stop the engine and spray with plenty of water.
  - Clean the grids: These either need to be taken out, or when the option easy liftable grid is installed, they can be lowered by rotating the reel mounted below the inspection door.

Grid 1 (needs to be taken out to reach grid 2)

Grid 2 (needs to be taken out to clean the fan house)

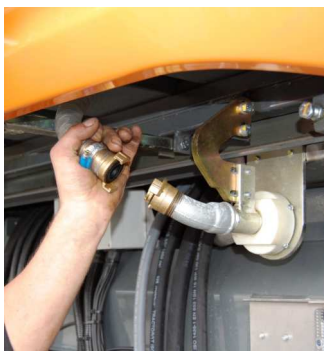
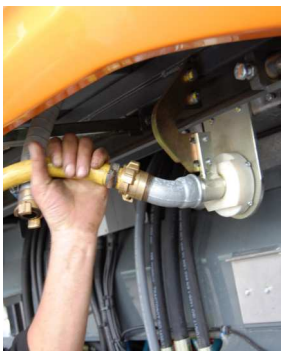
- Cleaning of the fan and fan house (Picture 1 – Standard):
  - Take out the second grid (or leave it lowered in case of easy liftable grid)
  - Start the engine (1100 RPM) and close the rear door
  - Open the service door and the inspection door and start the fan
  - Spray the fan with plenty of water for 2 minutes
  - Switch off the fan, open the rear door (place the security handle) and put the grids back in position.

Picture 1: Standard cleaning of the fan

Picture 2: Fan clean spray pipe

- Cleaning of the fan and fan house when option “fan clean spray pipe” is mounted (Picture 2):
  - Couple the water hose to the connection mounted above the inspection door
  - Start the fan
  - Open the water tap and let water flow to the fan for 2 minutes
  - Switch off the fan, take the hose off and put the grids back in position.

- Cleaning of the optional water recycling system
  - Open the water recycling box
  - Clean with low pressure water
  - Unhook the hose, mount the water hose and switch on the water recycling system so the system gets cleaned

6. Taking properly care of the Diesel engine, filters and water system

1. The Diesel Engine

Diesel engines suffer the most damage in their life due to working at the wrong temperature. Therefore it is important to give the engine some “peace” the first minutes of driving (even in Summer). So start the engine, and drive away after 10 seconds with an RPM between 800 and 1300. Slowly increase while driving.
When finishing the service, leave the engine running in idling mode for one minute before switching of.

N.B.: It is better **not** to heat up the engine by just switching it on and leaving it running in idling mode.

N.B.: In case you have an engine which requires AdBlue, make sure you never add anything else to the AdBlue tank than AdBlue. One small drop of oil could already damage the complete system!

N.B.: It is advisable to switch of the main electric switch (underneath the passenger’s seat) when the machine is stored for a longer period. However, always wait 3 minutes after switching of the engine before switching the main electric switch off.

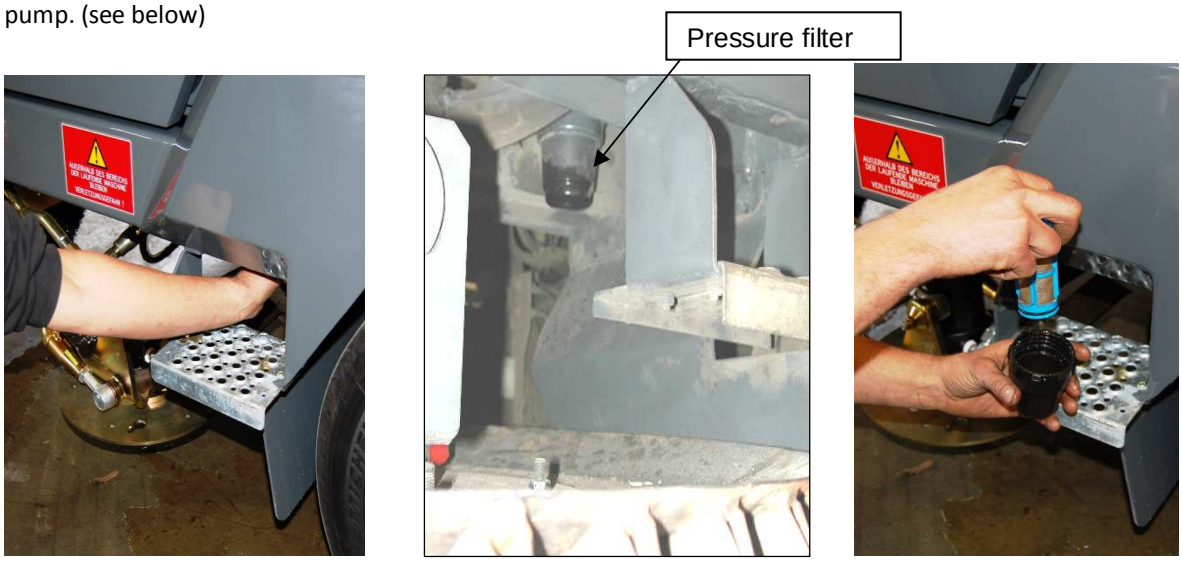
N.B.: When a red warning light is burning or the buzzer is making noise, park the sweeper and check what is wrong! Please remember that it also buzzes if there is not enough water or the water filters are clogged.

2. The water system

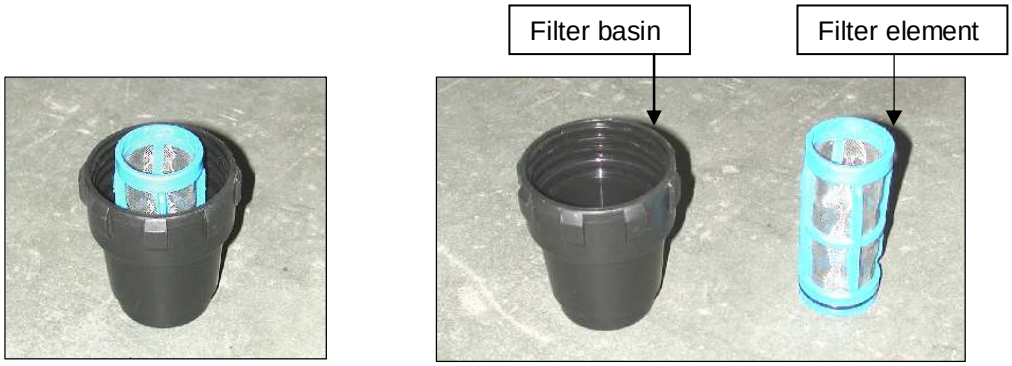
Before sweeping, check the engine and liquids as well. It is important that there is sufficient water! Also check the water filters, in case these are clogged, the pressure will decrease and the buzzer will give a signal sound! Checking of both tanks and filters is necessary!

2 A - Inspection of the pressure filter

The pressure filter is mounted underneath the chassis and the water will pass through once it has passed the pump. (see below)



This filter is easy to open for inspection (see below) and this should be done at least once a week. Then it should be checked for dirt (empty the little basin), cracks and if it is clogged.



2 B - Inspection of the suction filter

Take the cover of the water tank. The suction filter is mounted under in the water tank and should be checked at least twice a year (more in case of using surface water) on tear, dirt and if the filter is mounted over the metal pipe. (see below)

N.B: Don't clean the corrosion out of the tanks, since this is a protective layer!

3 Inspection of the air filter

Unscrew the cap

Take the cap of

Inspect and clean the filter*

Take the filter out

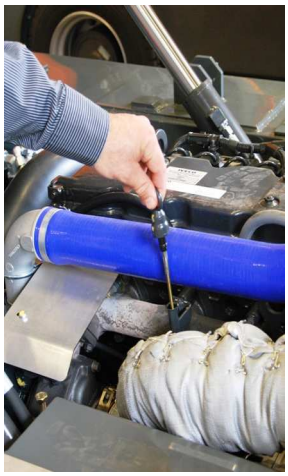
* N.B.: In case the filter can't be cleaned anymore, replace it.

4 Further inspection of oil, liquid and fluid levels (check weekly)

Wipers (behind pas. Seat)

Hydraulic oil (inside chassis)

Engine oil



Cooling liquid

7. What to do in case of a dead battery

In case of a dead battery NEVER use a jump starter. This will damage the drive computer, the EDC and Can Bus system and this can result in expensive repairs! Use instead:

- A spare battery set (preferable)
- Charge the battery at a loader

Please remember that batteries need to be checked regularly and a well charged battery increases the sweeper life!

8. How to tow the machine (please check the user manual as well!)

It is important to follow below procedure when towing the sweeper, otherwise the wheel engines will damage when towing.

- In case the engine doesn't work manually open the hopper
- 40 / 50 KM/H Version: Screw the wheel hub cap lose and take out, turn it around and mount it again
- 60 / 72 KM/H Version: Completely rotate the inner allen bolt for about 10 MM – Now the wheel engine is unlocked

- Completely unscrew the bolts out of the handbrake cylinder on both sides (left and right)
- Completely screw the long screw (on top of the cylinder) in (left and right)
- Now your machine is ready for towing, you can tow it with the towing hook

9. Frequently used parts

Service parts	Ravo PN	Qty.
Engine fuel filter	5013261	1
Fuel pre-filter	5140101	1
Engine oil filter	5013260	1
Oil sump ventilation filter (set)	5013262	1
AdBleu filter, only EURO4 and 5 engines	5013264	1
Engine air-filter	5010462	1
Cabin air filter	5033055	1
Hydraulic oil filter drive system	4010425	1
Hydraulic oil filter brake / front suspension system, from 02-2008 models	5060047	1
Hydraulic oil filter return	5060073	1
Multi-belt, engine cooling fan/generator	5015210	1
V-belt, spray water pump, tellarini, from 01-2004	5012165	1
V-belt, for air-conditioning compressor	5010140	1
Water filter cloth	5180330	1
Gearbox oil, MULTIGEAR 80W-140, 5ltr	5014350	5 L
Wear parts		
Suction nozzle	4241137	1
Side rubber left + right of suction nozzle	4240042	2 (L + R)
Rear rubber of suction nozzle	4240063	1
Rubber flap of suction nozzle	4240073	1
Wheel of swivel wheel	4240101	1
Grooved ring sleeve suction nozzle	4240010	1
Suction pipe lower part	5080012	1
Suction pipe bend	5080005	1
Suction tube connection on container ST(H)/CD	5045420	1
Suction tube extension in container ST(H)	5045710	1
Suction tube extension in container CD	5046465	1
Brush steel, diameter of 750 mm	4121010	1
Brush steel, diameter of 900 mm, only wide sweeping	5121012	1
New 3rd brush, weed cutter	5121013	1
Waterspray nozzle (incl. filter) new	2180225	1
HEAVY DUTY wear parts (high wear resistant due to special coating or material)		
Suction nozzle COATED	4241138	1
Suction pipe lower part COATED	5080111	1
Suction pipe bend COATED	5080141	1
Suction tube connection on container ST(H)/CD COATED	5080170	1
Extension piece container ST container ST(H) COATED	5080156	1
Heavy Duty Aluminium Fan	5040180	1